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17 August 1984

West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

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AEROSPACE

HIGH-TECHNOLOGY ACTIVITIES OF FRG'S LEYBOLD-HERAEUS

Duesseldorf HANDELSBLATT in German 30 May 84 p B8

[Article: "High Technology/Significant Successes Are Achieved in Space: Investments in Innovations Have Paid Off"]

[Text] The firm of Leybold-Heraeus, Ltd, situated in Cologne presents some very special and unusual features. The reason for this lies on the one hand in the technically and scientifically very impressive working areas of this firm and on the other hand in its entrepreneurial orientation which is entirely "futuristic." This course has led to a substantial expansion and importance in the marketplace. Thus, for example, in the past 10 years the firm has been able to increase its sales roughly fourfold to more than 662 million marks in 1983.

While stagnation or retrogression have in recent years been largely "normal" in Cologne business circles, LH [Leybold-Heraeus] is displaying balance sheets of a different sort. The firm--represented worldwide by 20 subsidiaries domestically and abroad--will until 1985 be erecting new buildings for development, manufacturing and administration in Japan, the United States, France and the FRG.

Of decisive importance for its "optimism manifested in investments" is Leybold-Heraeus' conviction that it is able to establish economically viable future-oriented technologies equipped with qualified and devoted workers. This becomes obvious even to the nontechnician when he enumerates some of the branches of industry and research to which the components, installations, and procedures or even entire systems of equipment are being delivered: space travel and space research, computer technology, new communications media, chemical and pharmaceutical process technology, preservation of food necessities and luxuries, analysis and refinement in metallurgy or advances in the use of energy.

The not inconsiderable funds which the company has in past years invested in the most traditional area--scientific-engineering courses for all types of schools, may be looked upon as being in a double sense investments in the future.

The development of new modern courses of teaching and training is having an increasingly more important role.

Microprocessor technology, computer engineering, electronic control and regulation technology are important contents for courses and continued education. Mastery of these subjects represents the key to success with the problems of tomorrow. Here are a few examples--representative of the wide-ranging program:

LH participated with two projects in the outer space laboratory "Spacelab" which at the end of last year, with the German Ulf Merbold, carried out investigations in outer space. In the "isothermal heating facility" it was possible to carry out metallurgical experiments under microgravitational conditions. In order to shorten the experimentation time this heating facility is equipped with a heating chamber and a cooling chamber usable in parallel for temperatures ranging from 45 to 1,600° C. The "vacuum-gas system" constitutes the second structural group developed and manufactured by LH. By means of this it is possible to evacuate all experimental facilities of the laboratory and moreover control the valves of these facilities. The "normal outer space vacuum" would not have met the quality requirements for the experiments and necessitates more than 100 times as much evacuation time (!).

The space simulation facility of the ESA (European Space Agency) is being built in the Netherlands with important participation on the part of LH. It is the task of the simulation facility to simulate conditions which approximate those in space as closely as possible, or as accurately as may be necessary. This involves both the pressure conditions (vacuum) and also the light conditions of the "optically completely black infinity of space" in addition to involving the temperatures. Here LH supplies--in addition to substantial planning and project work--the "shroud system" (simulation of thermal space conditions) and the supply systems for liquid and gaseous hydrogen.

The BKA in Wiesbaden and the National Police in the Netherlands are also among the LH clients. Both organizations have ordered equipment for dactyloscopy (fingerprint preservation). Previously they had the problem that on certain materials, for example, "plastic bags" (drug detection), it was hardly possible to preserve fingerprints. Now the materials bearing the fingerprints are subjected to a process of vapor deposition with gold, silver, copper or aluminum in a UNIVEX vaporizing apparatus manufactured by LH and in this way the prints are "secured." Some of the results obtained with paper have been astounding. Thus it was possible to make visible, and thus provide the best identification, a 13-month-old hand print on a paper bag.

Some internal aspects of the enterprise also served to indicate its unusual but promising tendencies. The fraction of engineers, physicists, chemists and plant managers among the total number of employees amounts to 21 percent. In comparison, for example, a mere 33 percent are engaged in manufacturing.

At a time when the number of employees was diminishing in most companies there was increasing employment at LH. Averaged over the last 4 years there was an increase of 2 percent in the number of employees and in the year 1983 the figure was even 3 percent as compared with the preceding year.

8008
CSO: 3698/495

FRANCE OFFICIALLY PROPOSES DEVELOPMENT OF ARIANE 5 TO ESA

Program Objectives

Paris AFP SCIENCES in French 21 Jun 84 pp 10-15

[Text] Paris--On 15 June, during a press conference, Mr Laurent Fabius, minister of industry and research, announced France's "considerable decision" to propose, as of today, to its other ESA [European Space Agency] partners, "to start preliminary studies in 1984 on the new LOX-LH2 [liquid oxygen-liquid hydrogen]-fueled cryogenic engine HM 60 and Ariane 5."

The French decision, signifying the development of a launcher capable of lifting heavy payloads and, eventually, manned mini-shuttles into orbit, was made at Matignon, on the eve of its announcement, by the Interministerial Committee, which is chaired by the prime minister, Mr Pierre Mauroy.

At the same time, France confirmed its participation in the European radar-observation satellite ERS 1, designed specifically for experiments on future radar-observation techniques and for oceanographic and climatological programs.

"France's objective," Mr Fabius stated, "is to ensure its own independence and that of Europe in the realm of scientific, technological, industrial, commercial and strategic space applications.

"A profound change in space activities looms on the horizon of the new decade," added Mr Fabius. "The Space Shuttle's arrival in the marketplace, and studies on manned orbital stations and their possible uses in domains as varied as metallurgy in microgravity, the manufacture of pharmaceuticals, earth observation, and military applications, are opening vast new doors to the future. We are now in a pivotal era: The marketing of our space-applications products has barely begun as new technical challenges await us, and new French and European approaches to new types of applications must be undertaken.

"Major decisions on space are made 20 years before their materialization, and if we are currently enjoying technical and marketing successes with present generations of Ariane launchers, it is because the right choices were made 20 years ago," Mr Fabius emphasized.

Mr Frederic d'Allest, CEO [chief executive officer] of the Arianespace Company, stated that "The cost of putting a kilo into orbit by Ariane 5 is expected to drop by 30 to 40 percent as compared with its prior generations."

The French proposals are expected to be studied at a meeting of the ESA around the end of this month; and the technical choices, particularly with respect to the Ariane 5 structures, are expected to be made final over the next several weeks.

Decisions

Mr Fabius indicated that the French Government has decided to propose to its ESA partners "to start preliminary studies in 1984 on the HM 60 cryogenic engine HM 60 and Ariane 5.

"The engine specification phase, lasting 4 years and costing around 1 billion francs, will permit the engine's technical characteristics, costs and delivery times to be defined. It will include studies on the most critical technologies involved and the making of the required investments for testing facilities. France is hopeful that the participation of our partners will be close to half the cost of the program, which will amount to 4 billion francs spread over a period of some 10 years.

"France will also propose to the ESA a study of the architecture of the new launcher, the Ariane 5. It will represent an entirely new generation. Its developmental cost will be of the same order of magnitude as that of the Ariane program to date, that is, around 11 billion francs."

Lastly, as regards radar observation by satellite, Mr Fabius announced that France will participate in the European radar-observation satellite ERS 1. "French industry will build the platform and the radar components; and the project will strengthen European cooperation in a high-technology domain".

The budget for this satellite is to total 4 billion francs over a period of 5 to 6 years, with French participation amounting to 800 million francs.

French Space Activities

Item	1981	1982	1983
Space activity in millions of francs [MF]	3,700	4,300	5,400
Exports included in above figures [MF]	600	650	820
Number of persons employed in sector	8,000	9,500	12,000

(Effects of Arianespace exports do not appear until 1984).

Noteworthy is the growth in research activity: The CNES [National Space Studies Center] budget has doubled over the past 3 years to 4 billion francs in 1984.

Ariane 5: Europe's Space Effort for Year 2000

What France is proposing to its ESA partners in asking them to participate in the development of heavy-satellite launcher, Ariane 5, represents a true space-industry challenge pointing toward the year 2000.

In commenting on the French Government's intent, Mr Laurent Fabius did not minimize the stakes and the ambitious objectives of such a program.

"Europe will have need, in 1995," he stressed, "of a space launcher of considerably increased power to be able to handle manned flights, should it be necessary, and to orbit the components of orbital stations.

"France's objective," the minister added, "is to ensure its independence and Europe's as regards space-industry applications."

This new generation of launchers will be capable of lifting 15 tons of payload into low earth orbit (altitude: 200-300 km) and 8 tons into geostationary orbit, as compared with 4 tons into low earth orbit for Ariane 4, which is the most powerful version of the first generation of Ariane launchers and whose entry into service is programmed for 1986.

These performance levels are to be made possible by a new cryogenic engine, the HM 60, fueled by liquid hydrogen and oxygen and capable of developing a thrust of close to 100 tons. Joint preliminary design studies on the HM 60, by Germany, Sweden and France, have been under way for almost 1 and 1/2 years now, and the French proposal to begin the optimization phase in 1984 should make its entry into service possible by about 1994.

Ariane 5 is thus the vehicle that, by the year 2000, would enable the orbiting of heavy payloads and, if necessary, a European mini-shuttle like Hermes, on which CNES is currently conducting feasibility studies.

Such a shuttle, capable of lifting four men and a payload into low earth orbit and of returning to Earth under its own power, would be a true space-services vehicle comparable to the American Shuttle, even though its weight- and volume-carrying capacities are clearly inferior to those of the latter.

Under the European space programs, a shuttle could, for example, provide service to automated platforms like those of the ESA's EURECA [European Retrievable Carrier] program, the first version of which is scheduled to be orbited by the American Shuttle in 1988.

It would be designed to accommodate experiments, observation equipment or microgravity-production units, and, from another standpoint, it would also provide a good approach to "mechano-space" techniques that would make possible, beyond the year 2000, the realization of an orbital staton.

From that point to the design of a European manned orbital station, serviced by a shuttle that is also European, such as would mean independence in this regard, is but a single step.

President Francois Mitterrand emphasized the importance of this kind of undertaking in his speech of 7 February at The Hague: "Once Europe is capable of launching a manned station that will enable it to observe, transmit and counter any and all potential threats, it will have made a long stride toward its own defense."

Moreover, the French proposal comes at a time when the Americans are offering the Europeans a partnership in their orbital station which is scheduled for 1992 and will involve a budget of $2 billion. The question before the Europeans, therefore, is whether to participate in the American project or row their own boat.

An intermediate solution will probably be the prudent one, and the projected Ariane 5-Hermes system would be not only a means of cooperating in an American station but also, later, a step toward realizing a European station in space.

Mr Fabius also pointed out that either European participation in the American station or a European project would in any case result in a 30-percent increase in the French space-activities outlay (France's present space--activities budget comes to 5.2 billion francs for 1984).

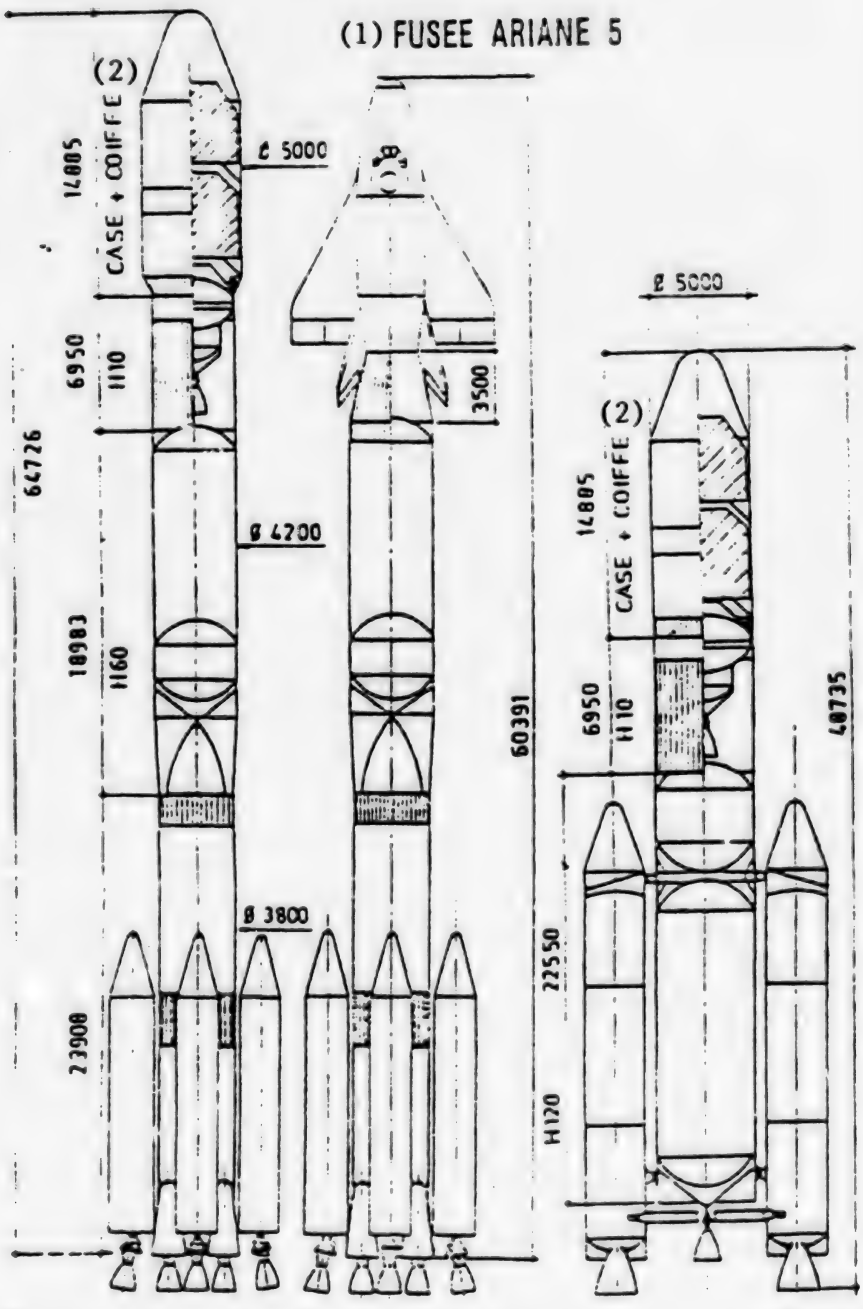
The Soviets, for their part, are concentrating on manned orbital flights of very long duration and are preparing new high-powered launchers and a shuttle, prerequisites to an intensive and profitable orbital activity.

[Photo caption p 14]: The HM 60 engine being designed for the Ariane 5 rocket will develop a thrust of 900 kilonewtons. It will be 4 meters high and have a nozzle diameter of 2.47 meters. Its operational duration will be 300 seconds and its weight 1,350 kilograms. This means that it will be comparable in size to the American Space Shuttle's SSME [Space Shuttle main engine], but its power will be less than that of the latter and more comparable to that of the Apollo program's J 2 engine.

Projected Hermes Mini-Shuttle

Paris AFP SCIENCES in French 21 Jun 84 pp 15-17

[Text] Paris--With the announcement of the submittal of the French proposal to the ESA [European Space Agency] to build the HM 60 engine for the Ariane 5 rocket, the studies on the Hermes mini-shuttle have received fresh impetus, although they are still being conducted as isolated team efforts separate from the organic structures of the entities involved, namely, the CNES [National Space Studies Center], ONERA [National Office for Aerospace Studies and Research], Dassault-Breguet and AEROSPATIALE [National Industrial Aerospace Company].



Three types of Ariane 5 rockets.

Left: The classic reference version, as it were, with its solid-propellant booster rockets for the lifting of two large satellites into geostationary transfer orbit. Center: The model incorporating Hermes--more a "mounted courrier and taxi" than a mini-shuttle. Right: The solid-propellant version also being studied.

Key:

1. Ariane 5 Rocket.
2. Bay and nose cone.

The design of Hermes is far from frozen as yet, according to CNES. Studies are going forward and will undoubtedly continue evolving.

The most recent figures among others released at Hanover by Mr Jean Claude Cretenet of CNES would indicate that the general characteristcs of Hermes will be the following:

--Length: 15 to 18 meters;

--Span: 10 meters;

--Height: 6 meters;

--Weight: 16.7 tons for circular low earth orbits (170 to 400 km); 13.1 tons for high sun-synchronous orbits (up to 900 km).

Its crew will consist of a pilot and copilot. On standard missions it will be able to transport two experimenters, plus, if need be, two other passengers. Its bay, measuring 3 meters in diameter, will be able to carry payloads of up to 4.9 tons, for example to or from a station in low earth orbit.

Its general outline bears a certain resemblance to that of the American shuttle, although it has not yet been decided whether it will have, a single empennage like the latter, or two. The fact is that within the terms of reference of the current preliminary studies, which have considerably evolved since the idea was first launched in 1976, Hermes is to be integrated into the European Orbital Program as the latter has been outlined over the past several months--manned scientific missions, linkups with EURECA [European Retrievable Carrier] platforms, earth observation, etc...--and also enable possible missions involving linkup with the future American space station. This means, in both cases, that it must have an adaptable bay.

Presently, Hermes is being conceived as a version of the future Ariane 5 rocket's third stage, capable of transporting a 4-man crew and cargo, and of retrieving in orbit, from vehicles in descendant free flight, for example, products manufactured aboard platforms of the EURECA and even the EURECA PLUS type.

As presently designed, Hermes's unassisted endurance limit after linkup with a space station is 9 days, and in unassisted free flight at least 10 days. Obviously, it will also have to be able to land on a runway close to its Guyanese launching facility--the necessary terrain exists on the Kourou savanna--as well as on runways in Europe that can be reached via a hypersonic flight of around 2,500 km.

The illustration on the preceding page shows three possible types of Ariane 5, the center one being the version with Hermes. The general shape of the mini-shuttle was defined by computer, taking into account the characteristics of the missions it is to accomplish and the constraints imposed by the hypersonic flight it will have to make regularly, the capacities of its heat shield, etc...

It should be noted that at the present stage of design work the mini-shuttle's structures require a heat shield that will reduce to a maximum of 175 degrees Celsius the temperatures to which they can be subjected during reentry.

Presently, the experts are studying three types of heat shield, using insulating materials, ablative agents, metals and high-temperature composites.

Overall, this heat shield is being targeted to represent 12 percent of the total weight of Hermes at the point of its reentry into the dense layers of the atmosphere, that is, the equivalent of the weight allocated to the same functions in an Apollo capsule.

The current preliminary studies are to continue until some time in 1986, after which the definitional phase of the vehicle is to begin. A first launching is to be targeted for some time in 1996.

9399
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AEROSPACE

POOR FINANCIAL RESULTS REPORTED FOR FRANCE'S AEROSPATIALE

Paris LIBERATION in French 25 Jun 84 p 14

[Article by Yves Mamou]

> [Text] The planning contract recently signed by SNIDS and the government foresees slump in sales for next 2 years and calls for effective restraints.

Will future technology have any future? The SNIAS (National Industrial Aero-Aerospace Company), which leads the electronics field both in the civilian and military domains, has just signed a "planning contract" with the government which is more than pessimistic. These state-public enterprise contracts are an innovation under the 9th Plan. The nationalized firms are required to draw up a 4-year plan in order to "verify cohesion between their prospects for development and the priority orientations defined by the government. The state-enterprise planning contracts, therefore, must contribute to 'the restoration of foreign trade, the growth of research, the improvement of the employment situation and the development of training and bring the PME-PMI [small and medium size businesses and industries] sub-contractors along the road to their own development.'"

However, on all these points the directors of Aerospatiale have not provided a way out of the crisis: Figures for the 1983 fiscal year [this figure not clear in original] show a deficit of 357 million francs on a revenue of 24 billion francs. Without citing any figures, Aerospatiale also shows substantial deficits for the years 1984-85-86. Revenue predictions are also very dark: 25 billion francs for 1984, a slight drop in view of inflation. The decrease will be 6 percent in 1985 (25 billion francs), and 11 percent in 1986 (23.5 billion francs). Aerospatiale, which produces both civilian (Airbus) and military (Transall, Mirage) aircraft, tactical missiles (Exocet), strategic ballistic systems and space launchers (Ariane), is in a slump today. It blames the second oil crisis, which hit the aeronautical industry hard and caused a drop in orders which severely penalized the firm's resources. At the same time, SNIAS adds, a burdensome, largely self-financed modernization program was begun. Given the government's difficulties in playing its role of shareholder, it is therefore logical that the firm's financial showing should still be poor over several years. For lack of its own funds, SNIAS's only hope is in a possible recuperation of the civilian aeronautics market, among other things

(unsold Airbuses are accumulating on the runways of the Toulouse airport), but above all in "continued support from the government as stockholder and as the promoter of new programs."

The rise in financing costs has clearly contributed to the drop in SNIAS's profitability. To compensate for the absence of new orders and the growth of inventories, the aerospace firm has gone heavily into debt these past 3 years. Between 1981 and 1983 more than 6.2 billion francs was probably borrowed from the banks, 4.4 billion on short-term loan. It is not surprising, then, that the year 1983 saw the interest burden rise in one year from 325 million francs to 837 million francs.

Although the revenue in 1983 was 24 billion francs, new orders are very much below the years 1981-82: 12.8 billion francs in new orders, compared with 15.6 billion in 1982 and 21.4 billion in 1981. The amount of orders for 1984 is still unknown (and with good reason), but a large part of the business done will be made up of orders taken in the preceding years. The missing figures will be available in 1985.

Aerospatiale's four divisions are all affected by the slump. The airplane division, which is in charge of the Airbus program, among others, is suffering more than ever because of the crisis in the airline companies which, in spite of an improvement in their balance sheets are too far in debt to buy new equipment. Of 279 Airbuses completed at the end of 1983, only 240 have been delivered. "Some of the planes already completed have no commercial destination (do not yet have a buyer)," the planning contract states. In addition, no new orders were taken in 1983. As for the new ATR 42 plan that SNIAS built in cooperation with Italy, "sales were at a standstill in 1983."

The helicopter division has felt "the effects of the slump in the American market." Only 40 machines were delivered in 1983, compared with 159 in 1981. "Previous business predictions did not anticipate such stagnation," the report points out, so that the helicopter division has "a large inventory on hand as well as its own expenses to meet; this requires a rigorous manufacturing adjustment."

The tactical engines division, on the other hand, had predicted a substantial decrease in its exports in 1983. An already over-equipped Middle East and lack of currency in the OPEC nations brought deferment and even cancellations of substantial orders.

Only the aerospace division (Ariane) has come out without a blemish, but a business cannot live on promises of development--which are continually postponed. So regardless of optimistic forecasts for civilian as well as military markets, the SNAIS knows that it is entering on a very lean period. The staff (35,463 salaried employees as of 31 December 1983) will have to be reduced. The report is clear on this point: "Decreased activity forecast for 1985-1986 would call for greater reductions in manpower, to which recourse to only partial shutdowns would not be a solution."

8735
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SEP OF FRANCE TO MAKE ARIANE HM-60 CRYOGENIC ENGINE

Paris AFP SCIENCES in French 12 July 84 pp 14-17

[Article: "New Wind For SEP, the "French Space-Engine Manufacturer"]

[Text] Vernon--In 1984, SEP, the European Propulsion Company, will manufacture and assemble one Ariane rocket engine practically every other week at its Vernon plant (Eure). At a meeting with a few journalists, Mr Roger Lesgards, the new chief executive officer of SEP, stated that "this vocation of the French space-engine manufacturer will further assert itself in the next few years, as a result of the development of the Ariane project."

At the rate of 8 Ariane launches from Kourou in the next few years, some 50 engines will have to be assembled every year, i.e. 1 per week (liquid-propellant Viking engines, powder-propellant engines, liquid hydrogen and oxygen HM-7 engines).

Mr Lesgards also stated that "a new and considerable responsibility will fall on SEP" with the start of the new HM-60 large cryogenic-propellant engine program proposed by France and approved by its European partners. This engine will be indispensable for the heavy launchers of the next decade and of the year 2000.

The transition to series production, the launching of new high-technology programs as well as the need for some diversification "will require systematic reflection and some changes," Mr Lesgards acknowledged.

SEP, which is manufacturing and testing French ballistic rocket engines and tactical missile engines at its plant in the Bordeaux area, will see its military sales (FF 1.38 billion in 1983) decline, while its sales to the civilian space industry will increase from 35 percent of the total in 1983 to 45 percent or so in 1984 and approximately 50 percent in 1985.

According to Mr Lesgards, who was for several years general secretary of the National Center for Space Studies (CNES) and, starting in 1981, in charge of research and space-related problems on the staffs of Messrs Chevenement and Fabius, SEP is "an industrial company" which he expects "is now truly entering a commercial era."

According to Mr Lesgards, a five-year development plan extending to 1990 should therefore be established, there should be greater commitment to research, and pluriannual cooperation programs with the CNES should be set up. However, he believes that once decisions are made, SEP should be fully in charge of their implementation, and that it should be able to invest and, therefore, raise capital.

"Apart from that," Mr Lesgards added, "SEP is in a sound position. Its rate of indebtedness is low, hardly 3 percent of its sales." According to data published recently, SNECMA (National Aircraft Engine Study and Manufacturing Company) could increase its interest in SEP from 37 percent at present to 51 percent, thus becoming a majority shareholder.

Other shareholders are Aerospatiale with 18 percent, SNPE (National Powder and Explosive Company) with 11 percent, Pechiney (18 percent), and Oxylex, a subsidiary of the Suez Company (7 percent), which means that over 90 percent of the SEP stock is held by national companies. The remaining 9 percent are held by Air Liquide.

In addition, consultations involving all of the SEP personnel will start, to find another name for the company, a name that would have greater impact and would better express the concept of "space-engine manufacturer" which will increasingly reflect the company's vocation.

The rocket-engine test benches of the SEP Vernon plant are the most powerful in Europe. Several new benches will be built at an approximate cost of FF 0.5 billion to test the future HM-60 engine, for which 20 ground tests are contemplated. The first of these benches, designed for the new turbopumps, should be placed in service already by 1987, and the test bench for the completed engine by mid-1989.

In the FRG--since the HM-60 program is a European Space Agency program--test benches will also be built at Lampoldshausen, near Stuttgart, and at Ottobrunn, on the one hand to achieve the redundancy which is required in such programs and, on the other hand, to be in a position to perform tests at the rate required by the program; the total cost will be FF 4.5 billion. Sweden, Belgium and Italy will also be involved in this program.

SEP is also interested in the ionic propulsion of satellites (ejection of ion beams yielding low power outputs but very long times of operation) and is also working on a contract from the European Space Agency.

"SEP is not an arsenal. We shall have to fight hard for our share of the markets," Mr Lesgards, who wants to give a "new wind" to the company, concluded.

The HM-60 Engine

SEP, which will be the prime contractor for the development of the HM-60 cryogenic-propellant engine, started its initial studies on this engine already in 1978. Today, 50 people or so are working on the project. The two-year pre-development contract with ESA is expected to be signed in October 1984.

SEP
Propellant Division to Liquids-Space

Provisional Characteristics of the HM-60 Engine on 9 July 1984 - Engine for the Central Body of Ariane 5 (Powder-Propellant Version)

(Figures in parentheses are for the old second-stage version)

- Cryotechnical engine (LH2-LO2) ignited on the ground (not in flight)
- Manned flight- Reliability > 0.99 with a 90-percent confidence level
- Selection criteria: 1. Minimum production cost
  2. Reliability - Maintenance - Utilization
  3. Minimum development cost and time
  4. Performance in excess of rated characteristics

- Vacuum thrust	100 t (85 t)
Focal pressure	100 bar
Outlet diameter	1.78 m (2.52 m)
Total height	3.14 m (4 m)
Piloting along 2 axes	$\pm$ 4°
Number of ignitions	$\geq$ 20
Specific vacuum impulse	> 430 s (445 s)
Mixture ratio	5.1
Section ratio	445 (111)
Empty weight	< 1,100 kg (1,350 kg)
Combustion time	600 s (291 s)
Cumulated combustion time	6,000 s

- Test Bench

Gas generator		Ottobrunn (MBB [Messerschmitt-Boelkow-Blohm])	FRG
Turbopumps	3 cells	Vernon (SEP)	France
Combustion chamber	1 cell	Lampoldshausen (MBB)	FRG
Vertical engine	2 cells	Vernon (SEP)	France
	2 cells	Lampoldshausen (DFVLR [German Aerospace Research and Testing Institute])	FRG

- Development: 20 engines for ground tests, including 5 for qualification tests (2 of which prior to the first flight launch).
  300 tests on an engine cumulating 70,000 s in operation.

- European Distribution Contemplated

France	51-53 percent	Engine and turbopump prime contractor
FRG	25-30 percent	In charge of combustion chamber and gimbal joint
Sweden	4-6 percent	Divergent and turbines
Italy	3-5 percent	
Belgium	2-3 percent	

We should note that the decision to use the more efficient derived-flow engine was made late in 1983; the U.S. shuttle engine, which is twice as powerful, is an integrated-flow engine. Actually, the time loss will be only 10 seconds for a total propulsion time of 4,400 seconds.

"To remain on schedule (see table) and make the first flight launch in 1994, we must start now," people in Vernon point out. SEP, which has invested some FF 3 million in computer-aided design, is going to make extensive use of this tool in designing the engine, on which 150 people or so should be working by the end of 1986.

As far as the various test benches are concerned, strong emphasis will be placed on computerized data processing. For instance, 400 different measurements will be made on the engine, at the rate of 125 points per second, i.e. a total of 400,000 measurements per second.

The cost of the test facilities will represent approximately one fourth of the total development costs, i.e. a solid FF 1 billion, to be distributed among France (60 percent) and the FRG (40 percent). The turbopump bench should be ready for operation at Vernon by 1987.

Generally speaking, the question that could be raised concerning the HM-60 engine is whether the budget allocated and the schedule imposed are really compatible with adequate research... to prevent the occurrence of incidents like those which, in the case of the turbopump, marked the development of the cryogenic-propellant engine of the third stage of Ariane.

The new structures which are now implemented at the initiative of the new chief executive officer, Roger Lesgards, are intended in part to answer this question.

9294
CSO: 3698/535

AUTOMOBILE INDUSTRY

NICKEL-IRON BATTERY TO BE USED IN PEUGEOT ELECTRIC CAR

Paris LE MONDE in French 1 Jun 84 p 18

[Article by F. R.]

[Text] On 20 June, the Peugeot Group plans to introduce an electrically-driven vehicle, its Model 205, powered by a new battery that has been developed by SAFT [Stationary Accumulators and Traction Company] of the CGE [General Electric Company]. This battery, called a nickel-iron battery, represents a giant step forward over the conventional lead storage battery: Half the weight and size and twice the life of the latter. These improved characteristics, despite the fact that its price is twice that of a lead battery (around 20,000 francs for a medium-sized vehicle), make it possible for a car equipped with a nickel-iron battery to travel over 100 kilometers at a speed of 100 km/hour, which is ample performance capability for a town car.

Arguing the case for this concept, Mr Georges Chavanes, president of the Leroy-Somer Company, the largest French manufacturer of electric motors and specialists in direct-current drive motors for self-powered industrial vehicles (300,000 over the past 30 years), says that the promising results obtained in this domain of nickel-iron batteries have now opened the door to a rapid development, with a potential market of around 150,000 to 200,000 vehicles annually by 1990, 100,000 of which would be for private use and 75,000 for us as public conveyances. Other advances have been made in the domain of power electronics for the control of electric motors, especially with regard to hybrid circuits (components and circuits on a ceramic base).

In Mr Chavanes's view, it is urgent that we not "miss the boat" in relation to foreign competition, which is very active in this sector, as we did in the case of industrial robots. Actually, the future of electrically-powered vehicles is today in the hands of the automobile manufacturers. To this effect, Mr Laurent Fabius, minister of industry, has been approached to promote the use of electric vehicles by the government, particularly the PTT. A figure of 5,000 vehicles a year has been suggested. In this regard, it appears to have been mistakenly affirmed that a proposed electric vehicle manufacturing plant in Lorraine could be employing some 3,000 persons.

Nothing of the sort is being planned for the moment. It has simply been said that a production of 20,000 vehicles per year could provide work for 30,000 persons; the new jobs created, however, would be only at SAFT (around 600), since, at Peugeot and Leroy-Somer, the problem at present is underemployment.

9238
CSO: 3698/526

CIVIL AVIATION

MBB COST-REDUCTION PLAN FOR AIRBUS CONSTRUCTION DESCRIBED

Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 8 Jun 84 p 18

[Article by Klaus Wiborg: "A Structural Design for the Airplane Factories on the Elbe and Weser: Production Costs of the Airbus Are Also To Become Competitive"]

[Text] Messerschmitt-Boelkow-Blohm GmbH (MBB), Division for Transport Aircraft and Passenger Aircraft, Hamburg and Bremen. Developing a passenger plane capable of competing on the world market, convincing the airlines of its performance capability and selling the aircraft in batches large enough for mass production is one aspect of the business of the European Airbus Association. The other aspect involves also producing the aircraft at economically acceptable cost and keeping pace with the American competition not only in quality but also in terms of manufacturing hours and manufacturing cost per aircraft.

The initial cost of the development and marketing of a completely new passenger aircraft is gigantic. The financial demands which add up to several billion dollars must be prefinanced for a period up to two decades. The giant mountain of these preliminary financial activities will begin to diminish at the earliest by the middle of the nineties when the airbus group hopes to have achieved the break-even point with their aircraft sales. The enormous financial risk which no single firm in the aircraft industry can undertake alone has resulted in a supranational form of cooperation in Europe called the Airbus Association. The FRG is participating to the extent of 37.9 percent in the financing (the same extent as France; the British are carrying 20 percent and the Spanish 4.2 percent). The manufacturing ratios within the aircraft industries of the participating companies are roughly in the same proportion as the financing ratios.

The German share of the manufacturing involved portions of the fuselage, the interior appointments of the fuselage as well s fitting out the wing with movable components and carrying out corresponding developmental work. These German activities were at first divided among the two aircraft firms MBB (Messerschmitt-Boelkow-Blohm GmbH) and VFW (United Aeronautics Works GmbH), particularly with their north German plants in the Unterelbe--Unterweser area. Some functions ranging from machining through sheet metal work to metal bonding were done in parallel and hence practically twice done. The

amalgamation of MBB and VFW in 1981 was not least of all a consequence of the recognition that in comparison with the Americans the production costs were much too high owing in part to this two-track operation. The steady operating losses cast threatening shadows across the future of the airbus industry. In contrast to its big competitor Boeing, the airbus industry can support itself on the profits of preceding successful production lines neither during preliminary financing nor in covering startup losses. It requires first of all the backing of state subsidies. This, however, presupposes that the industry shall achieve as soon as possible on its own power the "American level" in production costs. In other words it must become industrially competitive.

It has been possible to achieve a drastic cost reduction only by means of extensive specialization and through fine-tuning of production and investment on the part of the aircraft companies on the Elbe and Weser. It was not until the MBB-VFW amalgamation that impediments of company law could be eliminated and a way made clear for a "structural-design 'North'" consisting of the MBB transport plane and passenger plane division together with the plants in Hamburg and Stade (Elbe area) and Bremen, Lemwerder, Nordenham, Einswarden and Varel (Unterweser area). The structural design for the aircraft plants was finally agreed upon in the course of the year 1983 after long and difficult negotiations with the factory councils of the factories concerned. The design had been worked up in its basic outlines by the firm management but--since it includes relocation of factory subsections and includes manpower reductions--it also requires consultation with the workers. The first steps toward realization of this design have been taken this year. It should be completed by the end of 1987 with an expenditure of about 200 million marks.

As a result of this organizational design the MBB plants participating in the airbus program should by the end of this decade be operating at competitive cost. To achieve this it has in the interim even been necessary to considerably raise sights of this ambitious goal: the airbus group is now in a trough of the passenger aircraft business. It is true that the group, in agreement with all authorities on the passenger aircraft market, expects a vigorous upturn when from 1988 on the smaller airbus A 320 is introduced; but first of all it has been necessary to make substantial subtractions from the A 300 and 310 output figures which had been initially hoped for. The plants had set up with investments and manpower increases for a monthly output of eight airbuses or about 90 aircraft per year. However, in the present doldrums which will probably persist at least through 1985 the production figures have been cut down to a mere 3 to 3.5 airbuses per month. The business-economic design aims at having production in the black as soon as a manufacturing rate of only five aircraft has been reached. It is hoped that this rate of production will again be reached after an intermediate period and that in the nineties this figure will be far exceeded.

The MBB-North group, in its division of transport aircraft and passenger aircraft, employed at the time of the amalgamation about 16,500 workers. This included 1,800 people in research and development. Since then the number of employees has shrunk to about 14,500. When the organization design has been completely carried out this employment figure will probably be somewhat

smaller. With an efficient manufacturing flow from plant to plant the man-hours per aircraft should be substantially reduced.

The Varel am Jadebusen plant, for example, (a good 1,000 employees) delivers at a high level of automation the machined parts for the entire north region. (Today they are still being in part produced in Hamburg.) The Einswarden plant (1,700 employees) manufactures large sheet metal pieces and specializes in metal bonding and the assembly of fuselage shells which in Hamburg are assembled into fuselage cells and there also fitted out with all systems. The Hamburg plant also manufactures in the over 20-meter-long airbus fuselage tail the largest connected airbus structural component. Among the suppliers of the Hamburg plant there is the Stade plant (700 employees) which in the future will specialize entirely in carbon fiber solid solutions. The large structural components are transported to Toulouse in an unusual transport airplane, the "Superguppy." There the component is assembled into the finished fuselage and then assembled with the wings into the finished airbus. The airbus, now still "naked" inside but nevertheless capable of flying, returns to Hamburg and there receives its complete interior fittings.

In Hamburg the corresponding division--which also works on subcontracts for the MBB-South group specializing in military aircraft--employs, including developing, around 6,000 people. The next largest location is Bremen with about 3,500 employees (without Erno). In the airbus program Bremen specializes in the manufacture of small sheet metal parts and in equipping with all movable parts the wing frame produced in England. Bremen is also--since it is the site of the wind tunnel--involved in development, specializing especially in aerodynamics. The Lemwerder plant (about 1,000 employees) which is situated near Bremen on the Weser has withdrawn from airbus production. In the future it will concentrate entirely upon aircraft servicing and maintenance. All in all there remain out of the previous 22 task focal points of the plants, which had in part been doubly staffed, only 11 "capabilities," each of which is located in only one place. Just as a result of these changes and the consequent elimination of the double capacities the management estimates that there has been an annual saving of around 50 million marks. The entire sales volume of this division of the firm is around 2 billion marks annually.

Does not the fact that all plants are being kept in operation denote a fragmentation? Does this not hinder the necessary cost reduction? MBB has also examined this question and answers it in the negative--on the assumption that the expected upturn will eventually arrive. It must also be noted here that the aircraft plants have substantial structural-political importance in their localities (where there are very high unemployment figures) and for the entire coastal region. Roughly speaking, a third of the MBB employees in the north are located in each of the states of Bremen, Hamburg and Lower Saxony. In the difficult negotiations prior to the amalgamation this consideration probably played an important role. But considering the purely business economic aspects, this streamlined manufacturing association on the Elbe and Weser amounts to a fully competitive solution. This is particularly the case in view of the fact that no problems arise from the need to communicate over long distances. The distances between the component plants of the American competition are in part even substantially greater. Finally, with five plants in five locations employment peaks and valleys can be more easily weathered than would be possible at only one or two "super" plant sites.

8008
CSO: 3698/495

REVIEW OF INDUSTRIAL LASER USE IN SCANDINAVIA

Stockholm NY TEKNIK in Swedish 12 Apr 84 p 37

[Article by Jan Segerfeldt: "Growing Use of Laser in Swedish Industry...and in the Nordic Countries"]

[Text] The laser is today considerably more common as a processing tool in the Swedish engineering industry than most people know. It is used by both large and small industries and for a number of different applications. Cutting with lasers, welding and marking are the most common application areas.

Here are some of the Swedish companies and other organizations which use lasers as processing tools in their activities.

Bahco, Enkoping.

Cuts thin sheetmetal up to 3 mm thickness. The laser is part of a combination machine. The power is 500 W and the lasering medium is carbon dioxide. The company has 3 years experience using a laser in its production.

Akermans Verkstad Inc., Eslov.

Also cuts sheetmetal in a combined punching and nibbling machine. The laser part puts out 500 W and was delivered in 1981.

Siemens-Elema Inc., Solna.

For 3 years the company has been welding the seams of its pacemakers, heart stimulators, by means of a Neodymium YAG laser. The laser is pulsed to a mean power of 500 W. Yet another laser with 50 W output is used to engrave text on the surfaces of the pacemakers.

Asea-Hafo, Stockholm.

Uses a laser in electronics manufacturing. Microprocessing.

Rifa, Stockholm.

Uses a laser in electronics manufacturing. Microprocessing.

FOA, Defense Research Institute, Stockholm.

Conducts research on laser cutting of polymer-based composite fiber constructions. FOA has also developed a particle- and gas analysis accessory for studying substances which occur during cutting.

Lulea Institute of Technology, Lulea.

Devotes itself to macroprocessing with laser and in particular to how the laser and surrounding equipment form a usable industrial tool. (See separate article in section 2.)

CTH, Chalmers Institute of Technology, Goteborg.

Microprocessing. Conducts research and develops applications primarily for the electronics industry. See separate article.

Radian-Innova Inc., Goteborg.

Spinoff company on the grounds of Chalmers. Sells and develops systems around microprocessing. (See separate article in subsequent section.)

MeKanosvets Inc., Valdemarsvik.

Piece work with laser.

Stjarnstans Inc., Nassjo.

Produces punch dies for the paper industry. The punch tools are cut out by a laser.

Miller in Sunne Inc., Sunne.

Is the company that engraves pattern rollers for printing. Since 1976 the company has engraved with a laser. Today five lasers are in use. With lasers the problems of roundedness and joints in the rollers are avoided.

AB Laserstans, Trelleborg.

The 2-year-old company has a numerically controlled combined nibbling and laser machine. The laser is of the carbon dioxide type.

Rollform Inc., Goteborg.

With its 2-KW carbon dioxide laser the company welds spacer strips for windows. The production system is in-house developed.

SKF, Goteborg.

Has been using a laser to mark outer races for ball bearings for 6 months.

Kanonsegel, Stockholm.

Cuts sailcloth with laser.

Snaptap, Ludvika.

Has a 6-watt Neodymium YAG laser used to engrave hard-metal tools. In operation for over 1 year.

Teknodetaljer, Stockholm.

Piece work manufacture with laser.

Saab-Scania Nordarmatur, Stockholm.

Has bought a Neodymium YAG laser for delivery in March. Among other applications the laser will be used to cut cooling louvers in turbine nozzles.

Permascand, Ljungaverk.

Piece work and development work with laser. (See separate article in the first installment of the series.)

Denmark

Denmark is far ahead, both in industrial use of laser and in research. So far about 10 companies have installed lasers in their production. Many more are likely to follow, according to experienced sources. The power is usually in the 300 to 1,500 watt range.

A few companies have started piece work manufacture of various products suitable for laser processing. The products are, among others, thin sheetmetal details and tools. Several Swedish firms are noted among the customers.

Norway

The number of lasers in industrial production is clearly limited. The few industries using industrial lasers are doing piece work. There is great interest in the new processing technology, but equally great is the cautiousness of the Norwegians.

Welding very small medical pressure sensors is one application today. Another factory weids aluminum moldings for sealed multipane windows. Both examples involve the use of relatively small lasers of a few hundred watts.

Finland

A few Finnish companies use laser processing. The usual power is 500 W.

The laser users are piece work manufacturers for other industrial companies. One firm has installed a CAD/CAM system in which processing and cutting takes place by means of a laser. As in most other countries, Finnish lasers are used mostly for cutting metals and plastics.

11949
CSO: 3698/520

FACTORY AUTOMATION

NEXT-GENERATION PROGRAMMABLE AUTOMATION AT SIEMENS

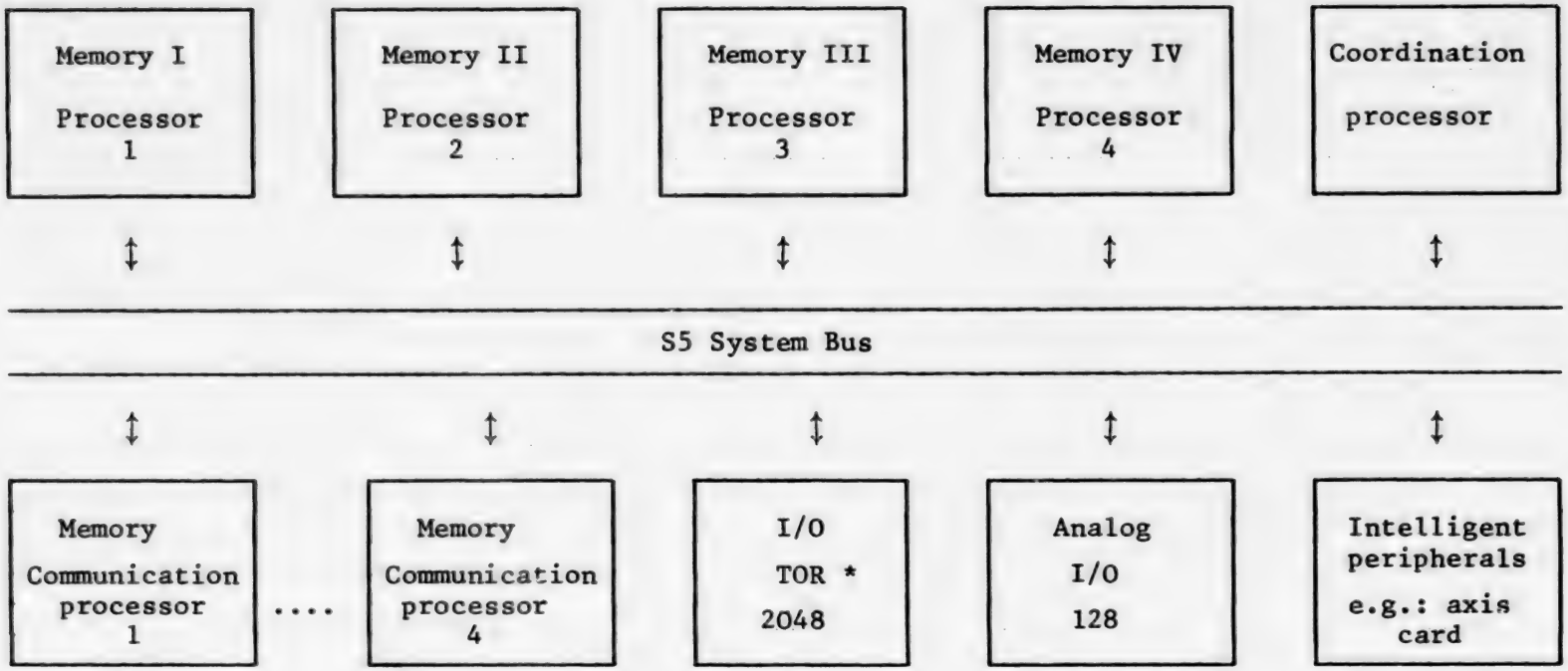
Paris ELECTRONIQUE INDUSTRIELLE in French 15 Apr 84 pp 16, 18

[Article signed P.I.: "The Siemens S5-135U: One Generation Ahead"]

[Text] Truly heralding what "tomorrow's" programmable controllers will be, the S5-135U made by Siemens marks a technological milestone in the evolution of these products. First introduced in France at the "Automation 84" show, the S5-135U does not appear to differ in any way from a traditional controller. You have to look at the internal architecture to see the "difference," namely a "multiprocessor" structure that makes it possible to actually distribute the various tasks and optimize processing times. Indeed, the S5-135U will accept up to eight specialized processors, each with its own program memory and internal bus: from one to four communication processors, and computation, regulation, (sequential) "control" and "coordination" processors, the latter synchronizing the various processors and serving as a mailbox through which the various processors can exchange data or results. Each processor is provided with its own interface with the programming console, and a skeletal software package makes it possible to configurate the communications of the system independently of the terminal used.

Multiprocessor, multiprocessing (n processors operating in parallel), the S5-135U also offers a new form of modularity. Actually, it is quite possible to start with a single processor and, as needs increase, implement new processors that will be programmed independently (it is not necessary to redesign the programs already developed). Finally, the total input/output capacity is of 1,024 inputs and 1,024 outputs with memory, plus 2,048 inputs and 2,048 outputs without image memory, and 64 analog input/64 analog outputs; it can be distributed over all the processors or over a single processor, depending on the configuration used.

Last factor: a 135U programmable controller with 8 (16-bit) kilowords of RAM or 16 kilowords of EPROM, with the simplest processor (which still can manage 8 PID [proportional, integral, derivative] loops in 100 ms and carry out floating-point arithmetic operations on 32 bits (!) will cost... FF 25,000.



Architecture of the S5-135U Programmable Controller

* expansion unknown

Technical Characteristics of the S5-1358 Programmable Controller

Characteristics	Sequential Processor	Regulation Processor	4 x Processors (Sequential or Regulation
Extent of basic functions	Instruction sets of the S5-150S, such as floating-point arithmetic and new functions: shift register, PID regulation algorithm		
Levels of ()	8	8	8
Type of processor	Processor-bit 8-bit micro-processor	16 and 8-bit microprocessor	
Cycle time for 1 kiloword	1 ms	20 ms	0.25 ms minimum
Reaction time	100 ms	20 ms	
Internal bits (memo pads)	2,048 non-volatile	2,048 non-volatile	4 x 2,048, incl. 2,048 max./ coupling
Programmable memory capacity	36 kilowords	36 kilowords	4 x 36 kilowords
Timing relays	128	128	4 x 128
Counters	128	128	4 x 128
Languages	STEP 5 LIST-CONT-LOG	STEP and assembler 186 high-level languages	
Inputs/outputs	1,024 each with image memory 2,048 each without image memory 64 each analog		
Connections	Maximum: 8 communication processors linked to computing controllers, printers, displays		
Structured programming	Max.: 32 OB 256 PB, SB, FB, DB [expansions unknown]		4 x 32 OB 4 x 256 PB, SB, FB, DB 4 x 64 FX, DX
Primary power supply	110 V, 220 V, 50/60 Hz		
Secondary power supply	5V/18 A and 24 V-/0.8 A		

9294
CSO: 3698/534

FACTORY AUTOMATION

FRENCH LABORATORY DEVELOPS POWERFUL 'LNA' LASER

Paris L'USINE NOUVELLE in French 19 Apr 84 p 11

[Text] A typical power laser today utilizes a neodymium-doped yttrium--aluminum-garnet crystal emitter. This type of laser is known as a yag laser. There is every reason to believe that tomorrow's laser of this type, an even more powerful one, will be based on an LNA (lanthanum-neodymium-aluminate) crystal, a name given to it by Professor Vivien and his team, of the condensed-materials chemical laboratory (a laboratory associated with the CNRS [National Scientific Research Center] in Paris, who have studied and developed it (with a 40-MF [million francs] grant from ANVAR [National Agency for the Implementation of Research]).

As compared with the yag laser, the LNA laser offers certain advantages straightaway: Much easier to produce, a substantially lower melting point (1810°C in lieu of 1940°C), hence lower energy costs for fabrication; synthesis based on oxides that are cheaper and more available in large quantities; and higher neodymium content, a property that translates into a higher output level of optical emission (at 1.06 microns).

After enlisting the aid of researchers of the CNET [National Telecommunications Research Center] to test the laser effect of LNA on a continuous basis, the team turned to the LETI [Electronics and Data Processing Technology Laboratory] of the CENG [Grenoble Nuclear Research Center] to develop a method for manufacturing monocrystals on an industrial basis. This work, which is still in progress, is being subsidized to the extent of 45 MF under the Electronics Sector Mobilization Program.

LNA is interesting from two standpoints: On the one hand, technologically, since the applications for which it is being developed are those of yag lasers, but with an advantage over the latter as regards power output levels: Industrial applications (drilling, cutting, welding, marking, etc), medical engineering, surface treatment of semiconductors (annealing of integrated circuits, etc), scientific instrumentation, military applications (telemetry, etc); and on the other hand, economically, since the international patent for this material should loosen the Japanese and American stranglehold which, via yag laser imports or their fabrication under license, is choking the French market for power lasers.

9238
CSO: 3698/526

DETAILS ON ROBOTS AT RENAULT'S CLEON, BOUTHEON PLANTS

Auto Engines Made at Cleon

Paris LE NOUVEL AUTOMATISME in French April 84 pp 29-31

[Unsigned article]

[Text] The search for flexibility is one of the concerns of automobile manufacturers, but their approaches differ. In assembling Saab automobile engines, Scania uses robots and has dropped the group work organization established in 1971, in favor of individual work stations serviced by moving carts. At Cleon, final assembly is performed by operators organized in groups which work at moving stations.

No Doctrine for Flexibility

In order to assure an ultimate daily production of 2000 engines by 900 workers at the Renault Cleon plant, it became necessary to build 65,000 square meters of space to shelter an extremely automated production structure capable of producing the entire family of F engines on a single line.

Preparation of engine blocks and heads involves two transfer lines supplied by wire-guided carts, capable of producing 170 units per hour.

Very automated, these lines are organized as machining lines. However, each unit--engine block or head--is placed on a special pallet as soon as it arrives. These pallets are handled by a flexible transfer line; each of them is equipped with a magnetic memory which contains exactly the various operations required by the part being transported. Through their readers, the programmable automatic machines at work stations can conduct a "dialog" with the pallet memories. For an overall rate of 2000 engines per day, it is possible to obtain a desired distribution among various models of the F engine, independently of the order in which the engine blocks or heads arrive at the processing line.

In the case of engine heads, of which there are two current types--gasoline and diesel, their 122 components are installed at 72 operation stations, of which 48 are automatic and 24 are manual. The engine blocks have 193 components representing 59 different items. They are assembled at 109 operation stations, of which 52 are automatic, 13 are semi-automatic, and 44 are manual.

For engine finishing, which is 60 percent automated, the Methods Services have created manual stations, notably for personnel with reduced physical aptitudes. This finishing process is performed on four assembly loops provided with 200 wire-guided carts equipped with steps that allow the operators to come aboard.

On each loop, a group of eight workers is involved with enhanced tasks on the basis of 10-minute operations, in which each person is responsible for a daily production and must comply with a quality level determined by contract.

Robots on Assembly Lines

On the assembly line for Saab automobile engines, operated by Scania in Sodertalje, six industrial robots have assumed a number of repetitive and heavy tasks. These installations are only part of a complete reorganization of assembly methods. The group work that Scania had introduced in 1971, is replaced by individual work stations. The system of materials handling by means of wire-guided carts has been retained. In 1970, the production rate was 50,000 units per year with a small number of models; today, it is 100,000 engines per year for some thirty different models.

The new head for the 16-valve supercharged engine with two overhead camshafts, requires new equipment, but thanks to industrial robots and to advanced peripheral equipment, the two models can be assembled in part on the same line. These robots are integrated at different locations on the assembly line. An IRB6 Asea robot installs the valve spring assembly, composed of two cups and the spring itself. Springs and cups differ from one engine type to another, but thanks to the flexibility of the system the change-over takes only 15 minutes. Another, at the next station, installs the valve stem retainers; others attach the head, the distributor, or the flywheel.

On part of the assembly line, a conventional system is retained at which operators install components common to all the engines, after which the engines are gathered on a mass transporter to be moved to manual stations. The engines are then transferred to wire-guided carts which receive a box containing most of the parts that have to be installed upstream. These carts allow the engines to be raised, lowered, pivoted, or tilted, thus eliminating many difficult working positions. The remainder of the assembly includes several individual work stations, where the cycles are 8-15 minutes per station depending on engine type.

Integrated Three-Dimensional Control

Two automatic three-dimensional control machines (AMT) are integrated into the engine block machining line. These measurement robots, manufactured by SEIV Mesure, make it possible to immediately detect all fabrication deviations, display out-of-tolerance readings, perform statistical analyses according to programmed software, and store and archive the information during production.

Installation of Retainers by Robots

The 10-gram retainers which attach the cups to valve stems, are supplied in their correct orientation by a vibrating bowl loader. An IRB 60 Asea robot transfers them to its own loader, which also includes a tool to compress the valve spring. For the retainers to fall into place, the compression must be of the order of 74 KgF; the robot must therefore be quite powerful, and in fact had to be rebalanced.

The robot can accept 32 retainers at one time and can thus process either two eight-valve or one 16-valve heads. The retainers are different for the two models, but replacement of the tool and reprogramming are a matter of about 15 minutes.

Flexible Workshops at Boutheon

Paris LE NOUVEL AUTOMATISME in French April 84 pp 65-67

[Unsigned article]

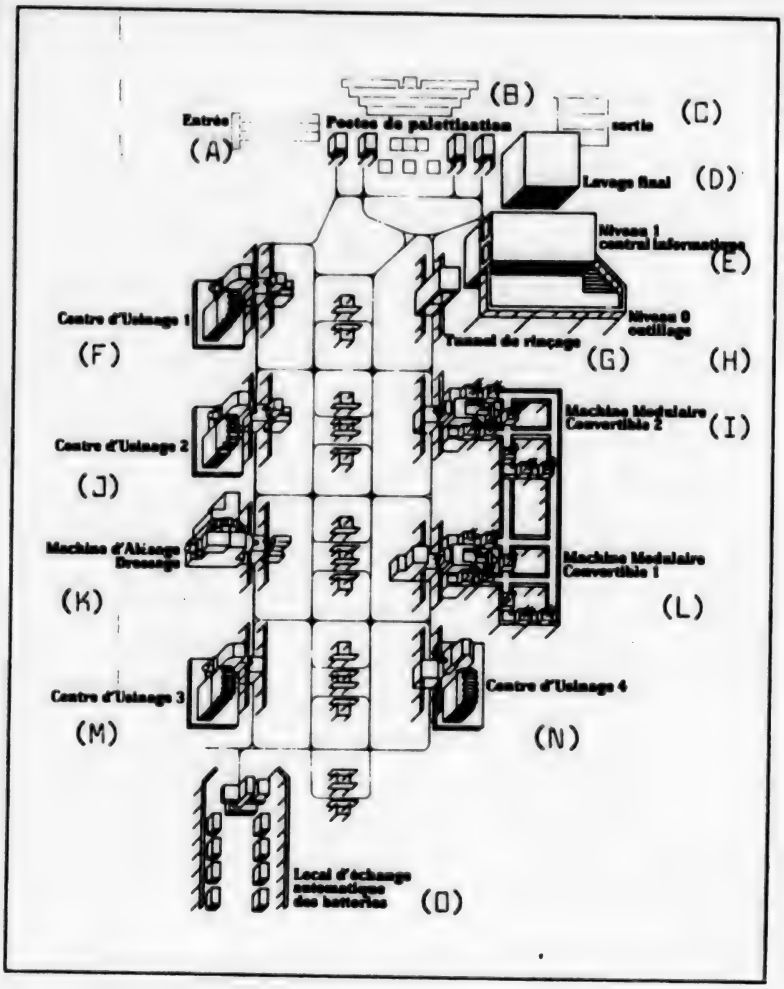
[Excerpts] These robots are not like other ones; they are self-propelled, wire-guided carts which automatically and optimally sort and handle all isolated loads. They are combined with automated stock transfer mechanisms for more efficient stock management and higher personnel safety.

Classic Example: Renault Industrial Vehicles at Boutheon

The flexible workshop is now an industrial reality. The one at RVI (Renault Industrial Vehicles) produces every day, in a particularly harsh industrial environment (oil, chips, humidity), about 50 gearbox varieties, each of them consisting of three parts: the main cast iron gearbox, the intermediate gearbox, also in cast iron, and the rear cover, either in cast iron or aluminum; each of these parts can be produced in several types depending on machining or application. The number of possible combinations of these parts can reach one hundred listed models.

In addition, types and machining selections are liable to change with time, depending on market demand.

Conventional automation with transfer lines was difficult to imagine; operating costs were considered prohibitive, waiting lines at machines would have been too long, and too many parts would have been in-process.



Installation of the Boutheon flexible shop.

Key:
- (A) Input
- (B) Palletization stations
- (C) Output
- (D) Final wash
- (E) Level 1 computer station
- (F) Machining center 1
- (G) Rinsing tunnel
- (H) Level 0 tooling
- (I) Convertible modular machine 2
- (J) Machining center 2
- (K) Boring and facing machine
- (L) Convertible modular machine 1
- (M) Machining center 3
- (N) Machining center 4
- (O) Automatic battery exchange center

Decentralized control structure at RVI-Boutheon. The central computer communicates with a number of SMC programmable automatic devices controlling the palletization and the machines, and with a central transportation logic (LCT), controlling the local transportation logic (LLT) which communicates with the carts by means of the network's communication contacts. LCT and LLT are both microprocessors.

Key: (A) Machining centers and boring and facing machine (MAD)
(B) Shop technician room
(C) Palletization
(D) Computer room
(E) Convertible modular machines
(F) Transportation logic

Covering 3000 square meters, RVI's flexible workshop includes seven numerical control machine-tools with automatic tool changers; it is serviceed by two input-output bases, consisting of two palletization stations at which an operator mounts a gearbox component on a pallet; eight wire-guided SEIV Automation carts bring the pallets to the machines and from one machine to another. The shop operates 3x8 (three eight-hour shifts) without interruption; the personnel is limited to five operators per team. Only computers can manage the complex traffic and machine programming; the shop consists of autonomous sub-assemblies (machines, materials handling, palletization) with their own logic (programmable automatic devices, numeric control, or microcomputer); a central computer coordinates and optimizes the operation of the whole system. This management method (in real time, of course) takes control of the parts starting at the palletization stations, and determines their transfer from one machine to another at various stages of the processing cycle.

Production can be modified simply by changing the parameters of the computerized management program and the programs of the numerical controlled machine-tools; this change takes only one-quarter of an hour; for a conventional production line, the machines would have had to be stopped for two days!

Renault persists and wire-guides, at Cleon this time. That is where are manufactured the "cast iron" engines for two-thirds of the Renault production. This manufacturing unit could ultimately build several engines from identical component parts; its work stations are relatively independent from each other, with buffer stocks of in-process units (automated if possible) and extremely flexible materials handling systems, consisting of 600 wire-guided carts that need no drivers, supplied by SEIV Automation (Teleseiv model for transferring engines to test benches), Saxby (Servocar model to service machining and assembly lines, as well as to supply the engine finishing sector), and CFC (Linecar mobile stations for finishing).

11023
CSO: 3698/531

STATUS OF THOMSON, MHS OF FRANCE ON SEMICONDUCTOR MARKET

Paris L'USINE NOUVELLE in French 19 July 84 pp 24-28

[Article by Claude Amalric: "Integrated Circuits: France Far Behind the Leaders"]

> [Excerpts] Thomson and MHS have invested huge amounts into integrated circuits. Profitability is around the corner. But their competitors acted still faster...

Semiconductor manufacturers are merry! They are living the best year ever experienced by their industry: they are all drawing up waiting lists for their customers, and these lists have never been as long; some are as long as 18 months! All competition being abolished, the French are not to be outdone.

Thomson is looking forward to an 80-percent growth of its sales in this sector, which should thus rise from FF 1.5 billion in 1983 to FF 2.7 billion this year, according to Jacques Noels, who is in charge of semiconductors at Thomson. "Growth is proceeding along the trend lines projected in the recovery plan," he commented modestly. Jacques Noels is wary of displaying excessive optimism. Trained at the school of Texas Instruments, he is too much aware of how much remains to be done to rejoice before it is time. Actually, Thomson cannot make do with a subsector policy like Matra-Harris (MHS) or even like La Radiotechnique-Compelec (RTC), which is closer to Thomson Components through the diversity of its products but belongs to a group--Philips--in which tasks are distributed.

Because its products range from TV sets to weapons systems, and because its production plant is still small as far as semiconductors and especially integrated circuits are concerned, Thomson must require its Components branch to make an effort in all directions. To succeed under these conditions, there is only one way: to grow to world size by acquiring approximately 3 percent of the market. This will correspond to the position of Matsushita, which ranks 10th among semiconductor manufacturers, as its activity in this field gave it 3.3 percent of the market in 1983, amounting to $600 million in sales. The U.S. company AMD [expansion unknown], ranking 11th with 2.8 percent of the world market, had sales amounting to $505 million, but only for integrated circuits, contrary to Matsushita. Both companies progressed remarkably in the last year. AMD grew by 53 percent (the strongest growth in the profession), the Japanese company by only 41 percent.

What about Thomson? In the Dataquest rating which all manufacturers use for their own studies, the French group ranked 26th in 1983, with $141 million. At FF 7.20 per dollar, the rate adopted by Motorola for its estimates in France for 1983, this amounts to little more than FF 1 billion for Thomson Semiconductors, compared with FF 1.5 million claimed by Jacques Noels.

Thomson: Recourse to the Financial Market

This shows the limitations of the Dataquest rating. All the same, for identical evaluations from one year to the next, and taking the dollar as a currency unit (which it actually is in this trade), Thomson regressed from the 18th rank in 1980 to the 21st in 1982, and lost another 5 ranks the following year.

Therefore, without losing sight of its receding objective--10th rank worldwide--the management of the French group is stepping up its efforts in the field of semiconductors. Of the FF 1 billion received this year from the State, FF 650 million were allocated to semiconductors! Yet, this will not be enough. As a result, Alain Gomez, chief executive officer of Thomson, is now having recourse to the financial market to find another FF 2.5 billion.

"We have come to the point where we are investing 34 percent of our sales during this key year, compared with 30 percent for the Japanese and 28 percent or so for the Americans." Jacques Noels stressed the profitability of such an investment: "There would be no point in building factories if we were not sure of selling the additional production obtained. The final result depends on the distribution of our investment among innovations, industrialization and sales capacity."

"For technology, we are among the world leaders. This is the positive side of the successive component plants," according to Jacques Noels. "In particular, we invest a lot in CMOS [complementary metal-oxide semiconductors] which will represent 40 percent of Thomson's integrated circuit sales by 1988."

Marked Regression of Europe

To become a leading world producer... In this context, it is easier to appreciate how ambitious Thomson's objective is. Especially as Thomson is not the only European manufacturer which ambitions to become a leader. Philips, which ranked 3rd in 1980 and 6th in 1983, does not intend to regress any more and is investing in the United States. Siemens, which still ranks 14th, and 2nd in Europe for semiconductors, especially thanks to its transistors, is developing its attack in the sector of "high-end" integrated circuits. The third serious competitor of Thomson is an Italian company. SGS-ATES [expansion unknown] went out of linear power circuits to take market shares away from everybody thanks to its new management team and specialties including CMOS. It is the only European company that managed to progress in the international rating: it was 23rd in 1981, then 22nd, and 20th last year...

Well then, Jacques Noels, mission impossible? "If I thought so, I would not have accepted it. We have assets. Certainly, the production units of our group are not of a consistent quality, some being much older than others. For integrated circuits, the most efficient right now is Eurotechnique in Rousset. But the others are making rapid progress. EFCIS [Company for the Study and Manufacturing of Special Integrated Circuits], for instance, rose from 300,000 to 1.5 million parts per month within 1 year."

These productivity gains are not due to a miracle recipe: "Making processes consistent, increasing series, etc. Many little things which add up or compound one another will make the difference without requiring a large investment." The recruiting carried out in the past two years by the Thomson management was such a contribution. A textbook example of changing mentalities is provided by Eurotechnique which had sales of FF 50 million two years after it was placed in service, when it was acquired by Thomson.

Selling to Japan: Hopefully Late in 1984!

In 1984, its sales should reach FF 300 million, due in part to the installation of four shifts, which should make its equipment profitable and improve its productivity by 12 to 15 percent. As a result, the cost of a silicon wafer carrying hundreds of chips was brought down from FF 1,400 to the normal value in the trade, i.e. about FF 1,200.

The third line along which development takes place is the sales force. It operated only in France; foreign markets were covered by multi-product agents. The logical result of such a policy was that the company was not very successful. Jacques Noels increased the staff by 60 percent. He now has 120 specialized engineers. Results soon followed this change. Export sales are increasing rapidly: from 28 percent of all sales in 1982 to 50 percent last year and maybe 66 percent in 1984. "By the end of this year, we are confident that we shall achieve 15 to 20 percent of our sales in the United States and in Japan!" Markets on which sales were nil in 1982. A nice demonstration of the aggressiveness of the new managers.

The integrated circuits manufactured by the group do not offer any particular specialization, for the reasons already mentioned. Yet, they follow the trends: gate-array circuits, graphic processors, circuits for plastic money and telecommunications and, of course, consumer products, "which cannot be profitable unless the company manufactures its own integrated circuits," Henri Starck, director of the group's Components branch, pointed out.

As far as microprocessors are concerned, the 16 and 32-bit models of which are expected to represent a market of $3.3 billion in 1988, Thomson is using the Motorola technology. "Actually, we had adapted the 68000 microprocessor to the 2-micron technology even before Motorola itself had done so," Jacques Noels pointed out with justified pride.

Carefully Selected Partners

But the U.S. company, which just reached a milestone when it produced the first genuine single-chip 32-bit microprocessor with a record capacity of 8 MIPS [millions of instructions per second], used the CMOS technology to

design it. It would appear that Thomson is also in a position to produce it, pending its own circuits of equal complexity.

For Andre Dumas, chief executive officer of MHS (51 percent Matra, 49 [illegible]ent Harris, the U.S. CMOS specialist, whose technology was also selected [illegible]el), problems are simpler. After losing FF 180 million for sales of FF 175 million in 1983 ("quite normal losses in this trade," Jean-Luc Lagardere was to comment), 1984 is more promising. Sales will double, reaching FF 350 million. But, above all, "balance will be achieved by the end of this year," Andre Dumas stated again, repeating the forecast made one year ago. Sales should double again in 1985, to an expected FF 500 million. "We must exceed 1 billion in the next 5 years."

Actually, if profitability is for 1985, MHS is expected to reach its cruising speed in 1986. "We shall then embark on the second stage: producing in the 1.25-micron technology." At present, MHS derives 40 percent of its sales from microprocessors, 35 percent from memories, 12 percent from gate-array circuits; the rest from telecommunication circuits. And 75 percent of the 1984 total in the CMOS technology received from Harris. "Our luck is that our partners are excellent." That is true. Harris just invested as much as Matra in MHS: FF 200 million. You have to have faith...

Another agreement, with Intel, resulted in the creation of Cimatel two years ago. With equal shares. This is an economic interest group which employs 30 people in Velizy to study telecommunication circuits. The first product will be introduced late in 1984. "Cimatel is a joint design-cell; but manufacturing and sales of the products designed remain independent. We shall therefore compete with Intel in selling integrated circuits designed by Cimatel..." This does not worry Andre Dumas very much, although he expects considerable sales of these products. "Our strategy is to be represented in large domestic products with high-end circuits." Exports? Approximately 40 percent of the products manufactured at Nantes leave the country. Seventy percent are sold in Europe through a network of 25 engineers set up jointly with Harris. "In the United States, they distribute our products as we distribute theirs in France."

The Rule of Every Man For Himself

In the rest of the world, competition to the hilt prevails. In France, MHS just increased from 9 to 12 the number of its sales engineers: a small firm which negotiated favorable agreements, the "integrated circuits" subsidiary of Matra, specializing (like the rest of the group...) in sophisticated products, does not have much to fear from the future. Because of its size (710 people) it is a precision tool. For mass production, see Thomson. In Nantes, 1,500 wafers are processed every week; twice as much next year. It is almost a family business... "We want to be among the world leaders," Jean-Luc Lagardere told us. If he should insist, Andre Dumas may lose his good spirits.

That leaves RTC. A 94-percent owned subsidiary of the Philips group, RTC is still considered as a French producer of semiconductors, due to the large

degree of autonomy enjoyed by the foreign subsidiaries of the Dutch group. Moreover, a new conception of nationality appears to be generally adopted: any company which designs, develops, manufactures and sells in France--for instance--is French. This is the case of RTC, although the group's subsidiaries throughout the world are connected by an inextricable network of technology and service exchanges.

As an independent profit center, RTC is doing well: FF 2.8 billion in sales in 1983; and 13.23 million of profits. It is not much according to Jacques Bouyer, its uncommunicative chief executive officer: "At any rate, it is below our projections." We shall not learn much more. What proportion of all components is represented by integrated circuits? Mystery. There remains a profession of faith: "For European manufacturers of semiconductors, there is only one way to go: specialization."

Thomson: Going Still Farther

Therefore, it looks as if those who will be excluded from such cross-agreements at various levels may become marginal. We may also expect that the reactions observed are only a facade and that, when the time comes...

In spite of all, and in spite of the overproduction that is already looming ahead for 1986, the chances of the French semiconductor manufacturers, and especially Thomson, do not seem to be as small as is often said. Well restructured to meet the realities of tomorrow, and carried by an expanding sector, Thomson could make its integrated circuits profitable. Even if it meant starting with the scraps left by larger companies. Considering where it started, and as long as it does not leave it at that, it would not be that bad...

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SIEMENS SUPPORT OF FRG VENTURE CAPITAL STRUCTURE EXPANDS

ICT Founded

Duesseldorf HANDELSBLATT in German 28 May 84 p 1

> [Text] Munich-- Research teams that leave their firms and become independent, the so-called "spin-offs", are not rarities in the U.S. In this country the Siemens electronic concern is making a beginning in this regard with the venture capital idea. This could be a decisive impetus for the entire branch of industry.

ICT is the name of a new establishment that offers diagnostic systems for integrated circuits. What is new is that the "new enterpreneurs" all come from Siemens and are leaving the concern with the full support of their erstwhile employer. They can take patents and licenses along. The electronic concern merely reserves the right to acquire 25 percent participation in the ICT without charge, should the new firm develop successfully. The participation will compensate Siemens for its developments and other diverse assistance, such as the costs of a prototype. The founding of the ICT is otherwise financed mostly by Techno Venture, a Venture Capital Fund in Munich in which Siemens holds minority interest, along with the TRV trust corporation and foreign venture groups. The fund will provide 49 percent of the founding capital and other credits. The rest is contributed by the brand new enterpreneurs themselves. A classical example of a "spin-off", one that could not have been carried out better even in the United States, the country of origin of the venture capital idea.

"These are millions that lay fallow", explains Dr Jochen Mackenrodt, the Siemens official for administering the participation, about the voluntarily "dismissed" technicians and their know-how, the patents and licenses they can use. This means that many inventions and developments are not used by large concerns, since they may have too small a market volume or may not fit into the production mix. "If each of the firms participating in Techno Venture brings forth even a couple of such spin-offs, think what can happen," Mackenrodt point out, since the list includes such firms as Daimler Benz, a large chemical concern, and the Deutsche Bank.

Since such "spin-offs" are among the most successful projects for venture capital in the United States, the Siemens initiative could be the starting gun for a successful transfer of the model across the Atlantic. U.S. venture capital funds have assets of an equivalent of DM 33 billion and have created hundreds of thousands of high-tech jobs. It is to be hoped that ICT will be a good example. The chances are good--an order from Siemens, the "foster mother", for DM 3.2 million has already arrived (see p 8).

Significance of Spin-Offs Discussed

Duesseldorf HANDLESBLATT in German 28 May 84 p 8

[Article by Peter Martin: "A New Impulse for German Risk Capital: Venture Capital; First 'Spin-Off' in the Siemens House"]

> [Text] Munich. The Munich electronic concern Siemens that has strongly advanced the most ambitious German venture capital fund, Techno Venture, with its 20 million mark participation, has gone one step further. A small team of Siemens technicans can become independent with the full approval of the firm and Techno Venture capital.

A Siemens development team that had been active in the diagnosis of integrated circuits has founded ICT (Integrated Circuit Testing Company for Semi-conductor testing technology Inc.) with the agreement of the concern. Techno Venture, whose management includes in addition to Siemens (25 percent) the Munich capital management society TRV and foreign venture groups provides ICT 49 percent and has allocated other credits for the "new entrepreneurs." As compensation for developments, licenses, and other assistance Siemens merely reserves the right to exercise a no-cost option for 25 percent of the new firm in case of success.

Spin-Offs Could Mean a Breakthrough

Such departures of development teams, often with the support of the firm from which the technicians come, are described in the United States as "spin-off." Financing of such establishments, as well as the purchase and separation of parts of an enterprise, the so-called "buy outs," represent approximately two-thirds of all venture capital investments in the United States.

These relatively funded financings have quite considerably contributed to the great success of the venture capital idea there. Venture capital funds across the Atlantic have assets of an equivalent of 33 billion marks and have created hundreds of thousands of new jobs. Experts are for this reason of the opinion that only with the help of "spin-offs" and "buy outs" the venture capital idea might have a chance in this country.

Why Siemens allows good people with know-how leave the firm and even supports them is explained by Dr Jochen Mackenrodt, who is responsible for managing the participation within the central financial sector: "In our 4 billion mark development activities there are projects in whose further development no central sector is interested, because they are either too small or do not

really fit well into our program. It is completely impossible to develop every invention that we make." So that such technically and economically interesting, but in-house unrealizeable inventions may not go unused, the "spin-off" is an attractive offer. Says Mackenrodt: "This is something that cannot do the great Siemens house any harm." To be sure, he also sees the importance to the national economy ("the billions spent on industrial research must be put into circulation,") but Mackenrodt stresses: "We are doing this not only because it makes sense from the national economic standpoint, we are, after all, not a foundation, this is above all interesting for us." Besides, he admits, "We cannot change this, if we do not do it, others will". For every venture fund manager it must be a tempting thing to help such experienced development teams to independence. It is obvious that Siemens would like to be from the very beginning at the head of this development.

The other contributions to Techno Venture--besides Siemens this includes Daimler Benz, the Deutsche Bank, the Hauni Werker, the Oesterreichische Indistrieverwaltung AG, and other enterprises, to include a chemical concern--also expressed approval and indicated their willingness for their own "spin-offs." In this regard it should be mentioned that the German investment circle for Techno Venture (100 million marks) is now complete. Together with 30 million marks from abroad the fund is to amount to 130 million marks, of which more than half is to be invested in the FRG. Techno Venture is thus in no way a "Siemens show," it operates on a profit motive and is independent. So independent that at first it rejected ICT, until its concept was further polished. After all, in spite of earlier sceptical voices, the fund cannot complain about a lack of offers for participation. For Techno Venture the ICT was only one possibility among many.

What is known about the new firm indicates that the fund managers can well hope for success of their participation. After all, the Siemens construction elements sector put a contract valued at 3.2 million marks "into the cradle" of ICT. The protoype paid for by Siemens evoked at a recent exhibition stand (also paid for by the electronic concern) interest besides the "former foster mother." The French post office was very interested, and other soundings have also been favorable. Should the establishment prove to be unsuccessful, in spite of favorable preconditions and chances, then Techno Venture can find solace in a bon mot of Jochen Mackenrodt: "This is the beauty of risk capital--it exists to be lost."

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SCIENTIFIC AND INDUSTRIAL POLICY

SIEMENS INVESTMENTS, ORDERS INCREASE IN 1984

Paris AFP SCIENCES in French 12 July 84 p 12

[Article: "Record Investments for Siemens"]

[Text] Stockholm--Siemens, the leading West German manufacturer of electric equipment, will make record investments of DM 2.2 billion during the current fiscal year (ending 30 September), i.e. an increase of close to 30 percent over 1983, it was announced on 11 July in Stockholm by Mr Karlheinz Kaske, Siemens's president.

During the first half of the fiscal year, DM 900 million (approximately $320 million) were already invested, i.e. 27 percent more than during the corresponding period of 1983, Mr Kaske added when he presented the 1984 provisional balance sheet of the group.

These investments are oriented mainly toward advanced technologies. Siemens is planning to invest a total of over DM 1 billion in microelectronics by 1990.

As an example, Mr Kaske mentioned a project called "Mega-Projekt." In a first stage, this project will involve the development of a one-megabit memory that could be mass-produced starting in 1987. This stage will represent an investment of DM 400 million.

Later on, the group will develop another memory, this time a four-megabit memory, which should be ready in 1989-1990. For this second memory, DM 400 million will be devoted to research and DM 100 million to manufacturing. The Mega-Projekt will already cost DM 200 million for the current fiscal year.

Mr Kaske also said that Siemens growth during the current fiscal year was satisfactory. Its sales should increase by 10 percent, reaching DM 45 billion. During the first 8 months of the current fiscal year, sales in the FRG increased by 17 percent, amounting to DM 12.6 billion, and foreign sales by 5 percent (DM 14.3 billion).

As for the orders received by the group, they increased by 3 percent from October to May, amounting to DM 32.8 billion. At the end of May, the backlog of orders amounted to DM 63 billion, compared with DM 57 billion one year earlier. Half of these orders are for the KWU [Power-Plant Union] subsidiary

of Siemens, specializing in the construction of electric power plants. According to Mr Kaske, orders received during the current fiscal year should total DM 46 billion.

Mr Kaske also announced that the electronic components sector, which had shown a deficit for the past three years, would return to a positive balance during the current fiscal year.

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BRIEFS

MULTINATIONAL VENTURE CAPITAL COMPANY--The so-called Rundabordsklubben [Round Table Club] of leading European industrialists, which was started by Pehr G. Gyllenhammar, has decided to establish a new venture capital company for the purpose of investing money in promising technological firms in Europe. Behind the new company--Euroventures BV--are Swedish Volvo and ASEA, Italian Fiat, Olivetti and Pirelli, French BSN, Lafarge Coppee and Saint-Gobain, Dutch Philips and West German Bosch. Together they will contribute about 240 million kronor, to be invested in five so-called satellite funds in various European countries. The funds in turn will then place the money in companies with a high growth potential. It is not clear whether any of the funds will be located in Sweden. The founders anticipate that the five funds, aided also by outside investors, will have a total capital of 800 million kronor. Euroventures BV will have its main office in the Netherlands and will begin its activity in January 1985. [Text] [Stockholm SVENSKA DAGBLADET in Swedish 26 Jun 84 p 21] 11949

CSO: 3698

BIOTECHNOLOGY ACTIVITY AT FINLAND'S OULU TECHNOLOGY PARK

Helsinki HELSINGIN SANOMAT in Finnish 26 Jun 84 p 23

[Article: "Technology Park Brings New Enterprises to Oulu"]

[Text] Oulu -- Inspired by the success of the technology park, the city of Oulu is already getting ready a new idea for applying biotechnology in large-scale industrial production.

Seppo Maki, public relations manager for the city of Oulu, says that it will be possible to apply biotechnology in the wood-processing industry, for example. In that case, the industry's odor problems would at least decrease noticeably.

"Biotechnology has been used traditionally in preparation of beer, cheese, clabbered milk, etc, but possibilities for broader use have not been studied," explains Maki in regard to the interest in biotechnology that has been aroused in Oulu.

The city of Oulu has been actively supporting the high-technology park that was established in Oulu a couple of years ago, with additional background support from the National Technical Research Center, the Regional Development Fund, and the University of Oulu. New enterprises in the technological park receive space, equipment and expertise for their use.

Very positive experiences have been generated by the park, and it is continually giving rise to new enterprises all around. Delighted with its experience, the city has tried to initiate discussions and get researchers interested in the use of biotechnology as well. But they are proceeding carefully in the application of biotechnology, and there is no intention of establishing a whole "park" like the technology park.

Next fall the city will organize a one-day biotechnology seminar, to which representatives of universities and industry will be invited. Three of the university faculties, medicine, natural science and technology, touch up on biotechnology in their research at least to some degree. The role of research will be emphasized because of the underutilization of biotechnology up to now.

Decisions on possible financing and support will be made by the city later in the fall.

Technology-park Project Making Progress

In order to further improve the influences of the technology park and to activate its economic policy, an economic policy development project called "Oulu -- City of Technology" has been started in Oulu. The project, which officially lasts three years, has the city in the main role. In addition, the University of Oulu and the Oulu Chamber of Commerce are participating.

The project leader, Mayor Ilmo Paananen, emphasizes the importance of cooperation, especially because nowadays more and more ideas are born from combinations of different branches of science. Through cooperation, they are attempting to diversify the industrial life of all of Northern Finland.

As the project proceeds, they will try to achieve regular cooperation between the city, educational institutions, enterprises, industrial organizations and other experts to facilitate exchange of information based on new technology and to apply it in production. The work of the project is being supervised by a committee appointed by the City Council.

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